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of injurious birds without indiscriminate onslaughts on the whole species. There are four valuable appendices, the first three dealing with protective legislation, the fourth a bibliography of economic ornithology.

There is naturally considerable unevenness of treatment in the account of the food of birds due to the gaps in our present knowledge of the subject, but the matter at Prof. Weed's and Mr. Dearborn's command, is presented clearly and in a scientific spirit. The doubtful birds, the crow, the crow blackbird, the bobolink, etc., are treated in an unprejudiced spirit: — they receive justice tempered with mercy. The book is intended not so much as a storehouse of facts, as a powerful argument, which cannot fail to have a very beneficial influence with the reading public.

The illustrations will give the book a little more favor with the people, and thus are a help. The cuts on pages 137 and on 139, however, are of doubtful value and the full page illustration on page 59 called American Long-eared Owl looks very much like a Short-eared Owl.

R. H.

BOTANY.

The Morphology of Angiosperms.¹— For several years past there has issued from the Botanical Department of the University of Chicago a series of studies upon the embryo-sac and related topics, some of which have been important contributions to the subject. These papers form the basis of the present volume, which has been prepared by the head of the department, with the assistance of Dr. C. J. Chamberlain. While the book contains little material that has not appeared before, nevertheless it can claim to be based, to a considerable extent, upon work done under the supervision of the authors. Evidently an enormous amount of literature has been gone over, and on the whole, the summarizing of the results has been well done, and the book will be very useful to the student who wishes to know the present status of the subject. One would feel more confidence in some of the conclusions reached by the authors, if these were based to a greater degree upon first-hand observations; but it is quite pos-

¹ Coulter, J. M. and Chamberlain, C. J. *Morphology of Angiosperms*. N. Y. Appleton & Co. 1903. pp. vii + 348.

sible that there is less personal bias than would be the case in a work based mainly upon the personal investigations of the writers.

The title of the book is, perhaps, somewhat misleading, as it deals only briefly with general morphology; but we think the authors have done well to restrict it mainly to the sporangium, gametophyte and embryo, since a general morphology of the vast group of Angiosperms could hardly be compressed within the limits of a single volume.

The book comprises seventeen chapters, of which the first nine will be found of the greatest value to the student for reference. In these the general morphology of the flower, the microsporangium, macrosporangium, male and female gametophyte and embryo are treated in detail, and on the whole extremely well.

The chapter on the flower is in our opinion one of the very best in the book. The author (we assume the senior author) shows here a sureness of treatment which comes only from an intimate first-hand knowledge of his subject, this being by no means so evident in some of the succeeding chapters, especially the one on the microsporangium, which immediately follows this chapter on the flower.

The chapter on the microsporangium opens with the remarkable statement that the *microsporangium* is derived from the periblem. To the reviewer is credited the statement that in *Naias* the sporangium arises from the plerome—a statement which it may be remarked, he did *not* make. There seems to be a curious confusion in the authors' minds between the terms "sporangium" and "sporogenous tissue."

We cannot accept the view here set forth, that the microsporangium in the Angiosperms is an endogenous structure. The author seems to have in mind the obsolete theory of the imbedding of an originally superficial structure, a view which is directly contrary to the conclusions of the most recent studies on the development of the sporangium. It is now pretty generally admitted that the eusporangiate type, such as that of the angiosperms is the more primitive form of sporangium, and the authors themselves assume the origin of the angiosperms from some form of eusporangiate pteridophyte. The close resemblances in the development of the sporangia between the latter and the angiosperms are familiar to every one who has made a direct study of the subject. We do not believe that the assumed difference in the origin of the archesporium is so fundamental as the authors claim.

It is strange that the most important work of recent years, bearing on the comparative development of the sporangium should be quite ignored. It seems hardly possible that the authors are not

acquainted with Bower's magnificent series of monographs on this subject, but we can find no reference to them in the book.

The idea of an imbedded sporangium seems to have been taken from the older German texts; but a careful study of the context, in either Goebel or Strasburger, will show that both of these authors consider the whole of the superficial tissue of the loculus, as forming the wall of the sporangium, and the whole pollen-sac as the direct homologue of the microsporangium of the pteridophytes.

It seems to be also assumed, although we can see no warrant for this, that the nucellus represents something more than a macrosporangium.

As might be expected, the development of the embryo-sac is given very complete treatment, the chapter dealing with this important topic comprising fifty pages, of which four are devoted to the bibliography. Much of the matter in this chapter is taken from the numerous papers which have been issued from the botanical laboratory of the University of Chicago, and many of the copious illustrations are drawn from the same sources. This chapter will probably be found the most useful in the book. The extensive literature of the subject has been carefully reviewed, and on the whole, little exception can be taken to the references selected to form the bibliography appended to the chapter. A great many facts are presented, and although the very number may be rather confusing to one unfamiliar with the subject, the chapter will nevertheless, give the student an excellent idea of the present status of our knowledge of the development of the embryo-sac.

The male gametophyte, naturally, has less space devoted to it, but is sufficiently complete. We should like to call the authors' attention to a mis-statement. The male prothallium of *Sparganium* is not referred to at all in the preliminary paper quoted, but was first described in the more complete monograph¹ published subsequently, and which seems to be unknown to the authors.

Chapters seven and nine are concerned respectively with Fertilization, The Endosperm, and The Embryo.

The chapter on Fertilization is well up to date, and gives a clear account of the latest studies upon this important topic. The chapter on the Endosperm is not so satisfactory, a number of more or less important omissions being noted. Thus no mention is made of the peculiar behavior of the lower endosperm nucleus in *Naias*.

¹ Campbell, D. H. Studies on the Flower and Embryo of *Sparganium*. *Proc. Cal. Acad. Sci.* Botany, Vol. 1, No. 9, 1899.

The treatment of the embryo is very satisfactory and leaves little to be desired. The discussion of parthenogenesis and polyembryony is especially good.

Except for the chapter on the phylogeny of the angiosperms, the latter chapters might have been entirely omitted without the value of the book being seriously impaired. The chapters on classification are entirely too brief to be of much value to the beginner, and the specialist will prefer to consult Engler & Prantl's *Natürliche Pflanzenfamilien*, from which the substance of these chapters is borrowed.

The chapter on geographical distribution is very fragmentary, and leaves something to be desired, also, in the matter of accuracy. For instance, we doubt whether the statements as to the relative numbers of Archichlamydeæ Sympetalæ and Monocotyledons will bear close examination. Thus the statement that the Archichlamydeæ and monocotyledons are relatively more numerous in the tropics than in temperate regions may be questioned. In round numbers the species of monocotyledons, Archichlamydeæ and Sympetalæ are 20,000, 60,000 and 40,000. A tabulation of the number of species in the Northeastern states is given in Britton & Brown—the numbers are respectively 1058, 1601 and 1361. It is thus seen that while the Sympetalæ are relatively slightly in excess, this is very much more marked in the monocotyledons, which our authors assert are relatively more numerous in the tropics. Two tropical floras were examined, Hawaii and the West Indies. In the former the figures are taken from Wallace's *Island Life*. The numbers are monocotyledons, 137; Archichlamydeæ, 271; Sympetalæ, 318. There is thus a marked predominance of Sympetalæ, and a deficiency of Monocotyledons and Archichlamydeæ, directly the reverse of the statement given by the authors. In the West Indies (Griesebach, *Flora of the British West Indies*) the numbers are approximately, Monocotyledons, 713; Archichlamydeæ, 1456; Sympetalæ, 913. The monocotyledons in both cases are relatively less abundant than in the strictly temperate flora of the Northeast United States.

The statement that the Archichlamydeæ have developed no characteristically boreal group, while the Ericales are essentially boreal, is not in accordance with the facts. The authors themselves have called attention to the peculiarly *austral* family of Ericales, the Epacridæ, and scattered ericaceous genera occur in the tropics, both of the old and new worlds. We should certainly consider the Salicales as quite as distinctively a boreal group as the Ericales.

The chapter on the phylogeny of the angiosperms contains much

of interest, and is clearly written. The recent speculations upon the relation of angiosperms and gymnosperms; the connection between monocotyledons and dicotyledons, are given due attention. In the discussion of the question of the possible monocotyledonous affinities of Podophyllum, it may be said that the suggestion that the two apparent cotyledons are possibly one, *morphologically*, was *not* suggested by Holm. Much stress is laid upon the somewhat dubious "Pro-angiosperms" of the lower Cretaceous. These are supposed to have arisen from some eusporangiate filicineous stock and to have given rise, independently, to the monocotyledons and dicotyledons. If we are to assume that the angiosperms are monophyletic, it is considered that the monocotyledons are probably derivations of the dicotyledons. The recent mutation theory of De Vries is also given due attention.

Prof. Jeffrey's contribution of two final chapters on the vascular system has some value in itself, but comparatively little bearing upon the morphology of angiosperms. Of twenty pages, less than six deal with angiosperms, and of thirty-three figures only five represent this group. These chapters seem to us unnecessarily loaded with technical terms, and are by no means easy reading.

D. H. C.

Notes.—No. 25 of the new series of "Contributions from the Grey Herbarium of Harvard University," issued as No. 5 of the current volume of *Proceedings of the American Academy of Arts and Sciences*, on Sept. 25, is an important paper by Greenman on Mexican and Central American Angiosperms, mostly of recent collection.

An account of an ecological study of Big Spring Prairie, Wyandot County, Ohio, by Bonser, is published as no. 7 of the *Special Papers* of the Ohio State Academy of Science.

Vol. 3, fascicle 1, of Urban's *Symbolæ Antillaneæ*, dated September 16, contains the first part of a "Flora Portoricensis," by Urban.

Fascicle 126 of the *Flora Brasiliensis*, issued in December, 1902, concludes Vol. 3, part 5, of the work, dealing with orchids.

The long-delayed number needed to complete the 1901 volume of the *Bulletin de la Société Botanique de France*, dealing with the 1901 session in Corsica, contains important data on the flora of that island, including an especially full account of the fungi.

An account of the vegetation of Corsica, with photograms, by Rikli, is published in the *Viertel-Jahrsschrift der Naturforschenden Gesellschaft in Zürich*, of Apr. 11, 1903.